

**Seal for protective masks.**

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**Abstract**

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The face seal (1) for protective masks presents substantially a bellows structure (4) and is adapted to surround the whole face of the user; the bellows structure (4) allows the face seal (1) to adapt itself easily to physically different faces, reducing the number of sizes in which the mask utilizing such face seal (1) has to be realized.

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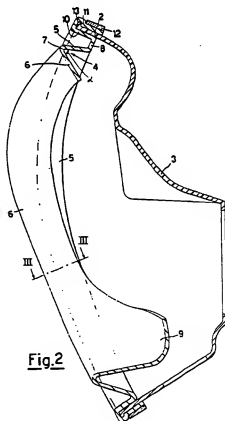
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**Seal for protective masks.**

The face seal (1) for protective masks presents substantially a bellows structure (4) and is asked to surround the whole face of the user; the bellows structure (4) allows the face seal (1) to adapt itself easily to physically different faces, reducing the number of sizes in which the mask utilizing such face seal (1) has to be realized.



**Fig.2**

## SEAL FOR PROTECTIVE MASKS

The present invention refers to a face seal for protective masks. The protective masks at present in use comprise a face-shield which acts both as support of the ocular surface and of the filter with which the mask is provided and as a seal on the user's face. The face-shield is made by a single piece of rubber which is sharpened at the edge in order to be particularly flexible and soft to adhere hermetically to the face with as much comfort as possible, acting as a seal. Far from the edge the rubber of the face-shield is on the contrary thick and presents a limited flexibility so that it supports rigidly the filter(s) and the ocular surface of the mask.

Therefore the face-shields of the current protective masks have to be realized trying to mediate the requirements of stiffness and of tightness and comfort which are obviously in contrast.

The object of the present invention is to provide a face seal associable to a face-shield, structured in whatsoever way, for protective masks, able to avoid the above mentioned drawbacks, namely to give the necessary tightness without weariness or inflammation of the circumferential portion of the face with which it interacts: said face seal is not affected by the deformations of the face-shield of the mask caused by the weight of the filter(s) and of the ocular surface.

Another object of the present invention is to allow many people to use the same mask reducing the number of the sizes necessary to satisfy a population of persons.

Such objects are achieved by a face seal for protective masks provided with a face-shield, characterized by the fact that said face seal presents an annular development and is provided with means for its fit to the edge of the face-shield of the mask and with means for the tightness between said edge and the user's face, having a bellows section.

The main advantages obtained by the use of such face seal on protective masks are the following:

- improved comfort of use of the mask with the highest guarantee of tightness;
- reduction of the number of necessary sizes with consequent standardization of the production of the masks;
- possibility to make the face seal by a type of rubber or other materials which privilege the characteristics of anti-allergy and softness in respect to those of durability, being possible to replace periodically and easy the possibly worn face seal with another one.

The invention is illustrated, just for exemplifica-

tion but not in a limitative manner, in the figures of the attached tables where:

- fig. 1 is a front view of the face seal mounted on a face-shield of the rigid type of a protective mask;

- fig. 2 is a cutaway view taken along the line II-II of fig. 1;

- fig. 3 is a section executed along the line III-III of fig. 2.

With reference to the above mentioned figures the face seal, generically quoted as 1, presents an annular development which allows it to anchor to an edge 2 of a face-shield 3 for instance of rigid type.

The face seal 1 comprises fitting means cooperating with the edge 2 and tightness means operating between said edge 2 and the user's face (not shown).

The tightness means of the face seal comprise a bellows 4 in which a first 5 and a second 6 annular foil are reciprocally hinged along a line 7 so that they form between themselves an angle "alpha" with concavity towards the interior of the face-shield 3.

The amplitude of the angle "alpha" is almost constant over the whole development of the face seal 1 close to the edge 2 of the face-shield 3, whereas the position of the whole of the two annular foils 5 and 6 with reference to the fitting means (and therefore to the edge 2 of the face-shield 3 included inside said means) is not constant. This is due to a connecting baffle 8 which reaches its largest extension at the top of the face-shield decreasing gradually up to disappear in the median and lower zones of the face-shield (see section III-III of fig. 2).

The second annular foil 6 extends itself to form a chin-latch by the lower part of the face-shield.

The means for the fit of the face seal 1 to the edge 2 of the face-shield 3 comprise a couple of annular flaps (internal 10 and external 11) joined together to form a U-shaped structure fitted on the edge 2 of the face-shield 3.

The external flap 11 is pressed against the edge 2 by a metallic hooping 12 made, according to the requirements, even by many pieces and cooperating also with a step 13 associated to said edge 2.

The face seal 1 can be fitted, with all the related advantages, also to a soft face-shield with the sole condition that the edge 2 is rigid and therefore independent from the means which fit it to the face-shield 3.

Wearing a mask provided with the face seal 1, the second annular foil 6 comes in contact with the

user's face (not shown) and rotates elastically around a hinge line approaching the first foil 5. The concave angle "alpha" between said foils reduces itself till the elastic force generated by the face seal 1 balances the elastic force produced by the means of fit of the mask to the user's head (not shown); said means are usually formed by elastic belts connected directly to the face-shield 3 of the mask.

Where the force produced by the means fitting the mask to the user's face is greater, the connecting baffle 8 is present and cooperates to balance said force by its deformation.

It is obvious that the rotation of the second annular foil 6 around the hinge line 7 with reference to the first annular foil 5, with the consequent approaching of the two foils forming the bellows 4, is also influenced by the dimensions of the user's face, which can vary without the arising of tightness problems.

#### Claims

1) Face seal for protective masks with face-shield, characterized by the fact that said face seal presents an annular development and is provided with means (10, 11, 12) for the fit of said face seal to the edge (2) of the face-shield (3) of the mask and with means (5, 6, 7) for the tightness between said edge (2) and the user's face, said means having a bellows section (4).

2) Face seal according to claim 1, characterized by the fact that said bellows (4) comprises at least a first (5) and a second (6) concentric annular foil joined together along a hinge line (7), said first foil (5) being integral to the means (10, 11) for the fit of the face seal (1) to the edge (2), said second foil (6) meeting operationally the face of the user of the mask.

3) Face seal according to claim 2, characterized by the fact that the first annular foil (5) extends itself to form a chin-latch (9).

4) Face seal according to claims 1-3, characterized by the fact that the first (5) and the second (6) annular foil diverge by a concave angle "alpha".

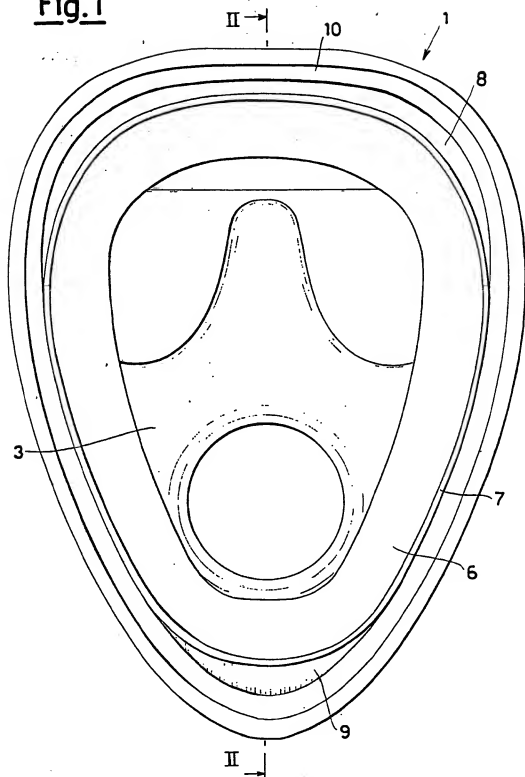
5) Face seal according to claim 4, characterized by the fact that the concavity of the angle "alpha" is towards the face-shield (3) of the mask.

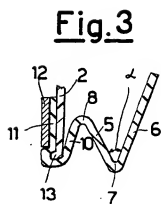
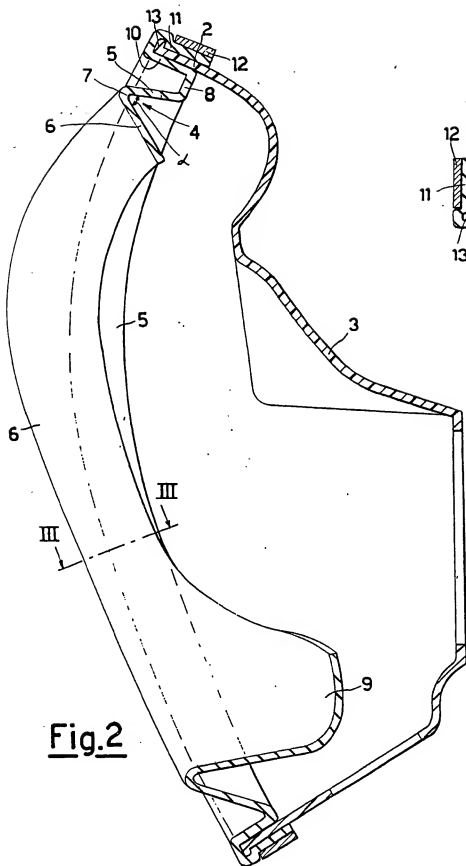
6) Face seal according to claims 4 and 5, characterized by the fact that said angle "alpha" presents substantially constant amplitude over the development of the edge (2) of the face-shield (3).

7) Face seal according to one or more of claims 1 to 6, characterized by the fact that a connecting baffle (8) is interposed between the means for fit of the face seal to the edge (2) of the

face-shield (3) and the tightness means (5, 6, 7) of the face seal itself, said connecting baffle (8) presenting its larger extension at the top of the face-shield (3) and disappearing in the median and lower zones of said face-shield (3).

8) Face seal according to one or more of claims 1 to 7, characterized by the fact that the means for fit to the edge (2) of the face-shield (3) comprise a first internal flap (10) and a second external flap (11) joined together to form a U-shaped structure surrounding the edge (2).

**Fig.1**





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 88 11 1946

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-3 545 436 (R.L. HOLLOWAY) * Columns 2,3; figures 2-6 *	1-6	A 62 B 18/08
X	US-A-4 069 516 (WATKINS Jr.) * Column 2, line 5 - column 3, line 18; figures 1,2,7 *	1-3,7,8	
Y	---	4,5,6	
Y	DE-A-2 815 779 (VEB KOMBINAT) * Page 4, line 17 - page 5, line 8; figure *	4,5,6	
A	FR-A-2 178 293 (ETABL. FERNEZ & CIE) * Page 3, line 28 - page 4, line 10; figure 1 *	1,3,4,5 ,6,8	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 62 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12-11-1988	Examiner WOHLRAPP R.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	